

REMARKS

I. Introduction

In response to the Office Action dated March 22, 2002, which was made Final, claims 1, 5, 10, 11, 13, and 16 have been amended. Claims 1, 3-5, and 7-17 remain in the application. Entrance of these amendments and re-consideration of the application, as amended, are respectfully requested.

II. Art-Based Rejections

In paragraphs 2-5, the Office Action rejected claims 1 and 5 under 35 U.S.C. § 102(e) as being anticipated by McKnight, (USPN 6,144,353).

In paragraphs 6-10, the Office Action rejected claims 3,4,7,8, and 9-17 under 35 U.S.C. § 103(a) as being unpatentable over McKnight in view of Sawada (USPN 6,078,317).

The Applicants respectfully traverse the rejections, and in order to expedite prosecution, have amended the claims in order to overcome the rejections and place the application in order for allowance.

A. The McKnight Reference

The McKnight reference discloses methods and display systems which modulate a control electrode to cause an electro-optic layer to be reset to a state in which display data is not viewable. See Abstract. Specifically, time related applications of this control voltage applied to the control electrode and the intensity of the pixels in a liquid crystal display are discussed. See Col. 10, lines 1-50. Two time related graphs, indicating the relationship between the control voltage applied to the control electrode, such as the cover glass electrode, and the intensity of the pixels in a liquid crystal display of the present invention are discussed. The voltage waveform 151 of FIG. 2C shows the control signal applied to the electrode, and the

intensity waveforms 152 of FIG. 2C show the corresponding intensity waveforms at the corresponding times. See Col. 10, lines 1-8.

At time when the voltage applied to the electrode is ramped up to a point at which the voltage across the liquid crystal is at least at V_b , this causes the intensity of the pixel to drop rapidly as shown by the pixel intensity curve 153. Then, between the times t_0 and t_1 , the next pixel display data may be loaded onto the pixel electrode while the display is held in a state in which display data is not visible due to the voltage applied to the control electrode such that the voltage applied to the control electrode is at or exceeds V_b . See Col. 10, lines 9-19.

B. The Sawada Reference

The Sawada reference discloses a display control apparatus for displaying an image by receiving an RGB video signal including an image signal and a synchronizing signal receives horizontal and vertical synchronizing signals in the RGB video signal, and detects the current display mode using a display mode detector. See Abstract.

C. The Claims are Patentable over the Cited References

The present invention is directed towards liquid crystal displays. An embodiment of the present invention is a liquid crystal display having liquid crystal sandwiched between a pair of substrates. The substrates have electrodes for driving the liquid crystal based on respective R, G, and B signals to control transmittance of each of the R, G, and B light components for color display, wherein each of upper limit values of ranges for driving voltages respectively for R display, G display, and B display applied to the liquid crystal is set independently for R light, G light, and B light, without a control voltage applied to the substrates to control the intensity of R, G, and B light simultaneously.

The cited references do not teach nor suggest the limitations of the claims of the present invention. Specifically, the cited references do not teach nor suggest

independent driving voltages for R light, G light, and B light, without a control voltage applied to the substrates to control the intensity of R, G, and B light simultaneously.

FIG. 2C of McKnight, specifically reference numerals 152/154/156, are not the driving waveforms that are fed to the pixels of the LCD as discussed in the Office Action. Reference numerals 152/154/156 indicate the output of the pixels when the control signal is applied to the cover glass electrode. See Col. 10, lines 1-50. The McKnight reference specifically states that "[t]his (the application of the control voltage waveform 151 to the cover glass electrode) causes the intensity of the pixel to drop rapidly as shown by the pixel intensity curve 153." See Col. 10, lines 12-14. "At this point beginning at time t1, the liquid crystal begins to return to a light altering state, as shown by the pixel intensity curve 154." See Col. 10, lines 24-26. The pixel intensity curves 152/153/154/156 are outputs of the pixels, not inputs to the pixels, as discussed in the rejections contained in the Office Action.

McKnight discusses controlling the intensity of the pixels using a common control voltage applied to the cover glass, which is an extra electrode not present in the present invention. Such an extra electrode requires extra fabrication steps and is more costly than the present invention. As such, Mc Knight does not teach nor suggest the limitations of the present invention, namely, the independent driving voltages for R light, G light, and B light, without a control voltage applied to the substrates to control the intensity of R, G, and B light simultaneously.

The ancillary Sawada reference does not remedy the deficiencies of the McKnight reference, namely, Sawada does not teach nor suggest independent driving voltages for R light, G light, and B light, without a control voltage applied to the substrates to control the intensity of R, G, and B light simultaneously. As such, independent claims 1, 5, 10, 11, 13, and 16 are patentable over the McKnight and Sawada references.

Dependent claims 3, 4, 7-9, 12, 14-15, and 17 are also likewise patentable over the cited references, because they contain all of the limitations of the

independent claims. Further, the dependent claims recite additional novel elements which further distinguishes them from the cited references.

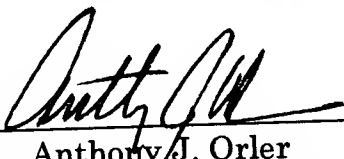
III. Conclusion

In view of the above, it is submitted that this application is now in good order for allowance and such allowance is respectively solicited. Should the Examiner believe minor matters still remain that can be resolved in a telephone interview, the Examiner is urged to call Applicants' undersigned attorney.

Respectfully submitted,

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APPENDIX A: CLAIMS IN MARKED-UP FORM

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1. (Twice Amended) A liquid crystal display having liquid crystal sandwiched between a pair of substrates having electrodes for driving the liquid crystal based on respective R, G, and B signals to control transmittance of each of the R, G, and B light components for color display, wherein each of upper limit values of ranges for driving voltages respectively for R display, G display, and B display applied to the liquid crystal is set independently for R light, G light, and B light, without a control voltage applied to the substrates to control the intensity of R,G, and B light simultaneously.
3. (Amended) A liquid crystal display according to claim 1, wherein a liquid crystal control driving signal for R light, a liquid crystal control driving signal for G light, and a liquid crystal control driving signal for B light are separately subjected to gamma correction based on transmittance characteristics of the R, G, and B light components.
4. (Unchanged) A liquid crystal display according to claim 1, wherein the pair of substrates includes a first substrate, electrodes for driving the liquid crystal formed on the first substrate include a plurality of pixel electrodes arranged in matrix thereon; and the plurality of pixel electrodes are connected to corresponding poly-Si thin film transistors each using a poly-Si layer formed at a low temperature for an active layer.
5. (Twice Amended) An electrically controlled birefringence type liquid crystal display having liquid crystal sandwiched between a pair of substrates having electrodes for driving the liquid crystal based on a liquid crystal control driving

signal for R light, a liquid crystal control driving signal for G light, and a liquid crystal control driving signal for B light to control transmittance of each of the R, G, and B light components for color display, wherein each of upper limit values of ranges for driving voltages respectively for R display, G display, and B display applied to the liquid crystal is set independently for R light, G light, and B light, without a control voltage applied to the substrates to control the intensity of R, G, and B light simultaneously.

7. (Amended) A liquid crystal display according to claim 5, wherein the liquid crystal control driving signal for R light, the liquid crystal control driving signal for G light, and the liquid crystal control driving signal for B light are separately subjected to gamma correction based on transmittance characteristics of the R, G, and B light components.

8. (Unchanged) A liquid crystal display according to claim 5, wherein the pair of substrates includes a first substrate, electrodes for driving the liquid crystal formed on the first substrate include a plurality of pixel electrodes arranged in matrix thereon; and the plurality of pixel electrodes are connected to corresponding poly-Si thin film transistors each using a poly-Si layer formed at a low temperature for an active layer.

9. (Amended) A liquid crystal display of claim 1, wherein each of said upper limit values of ranges for the driving voltages applied to the liquid crystal is set based on the transmittance characteristic of each of R, G, and B light components.

10. (Amended) A liquid crystal display having liquid crystal sandwiched between a pair of substrates having electrodes for driving the liquid crystal based on

respective R, G, and B signals to control transmittance of each of the R, G, and B light components for color display, wherein each of upper limit values of ranges for driving voltages for application to the liquid crystal is set independently for each of R, G, and B light, without a control voltage applied to the substrates to control the intensity of R,G, and B light simultaneously, and the maximum difference among the set voltages stays within 20%.

11. (Amended) A liquid crystal display having liquid crystal sandwiched between a pair of substrates having electrodes for driving the liquid crystal, and which shows non-transmittance to the light when no voltage is applied, for applying driving voltages to the liquid crystal based on each of R, G, and B signals to control transmittance of each of the R, G, and B light components for color display, wherein each of upper limit values for defining the maximum light transmittance of the liquid crystal, of ranges of driving voltages applied to said liquid crystal, is set independently for each of R, G, and B light, without a control voltage applied to the substrates to control the intensity of R,G, and B light simultaneously.

12. (Unchanged) The liquid crystal display of claim 11, wherein the maximum difference among said set upper limits of ranges of driving voltages applied to the liquid crystal for each of R, G, and B light never exceeds 20%.

13. (Amended) A liquid crystal display, wherein liquid crystal is sandwiched between a pair of substrates, individual pixel electrodes are formed for each pixel on one of said substrates, R, G, and B driving signals corresponding to each of said pixel electrodes are applied for driving the liquid crystal by the potential difference between said pixel electrodes and opposing electrodes formed on the other substrate, to control the transmittance of each of the R, G, and B light components for color display, and

each of upper limit values of ranges for driving voltages respectively for said R, G, and B driving signals applied to said pixel electrodes is set independently for R, G, and B light, without a control voltage applied to the substrates to control the intensity of R,G, and B light simultaneously.

14. (Unchanged) The liquid crystal display of claim 13, wherein the maximum difference among said set upper limits of ranges of driving voltages for each of R, G, and B light never exceeds 20%.

15. (Unchanged) The liquid crystal display of claim 13, wherein the maximum light transmittance is defined by said upper limit values of ranges of said driving voltages.

16. (Amended) A reflective type liquid crystal display having liquid crystal sandwiched between a pair of substrates, a reflection electrode formed on one of said pair of substrates, for driving the liquid crystal by the potential difference between said reflection electrode and a transparent electrode formed on the other substrate, to reflect the incident light from said transparent electrode side at said reflective electrode and to control the amount of light of each of the R, G, and B light components re-emitted from said transparent electrode for color display, wherein each of upper limit values of ranges for driving voltages for R display, G display, and B display applied to said liquid crystal by said transparent electrode and said reflection electrode is set independently for R, G, and B light, without a control voltage applied to the substrates to control the intensity of R,G, and B light simultaneously.

17. (Unchanged) The reflective type liquid crystal display of claim 16, wherein said reflection electrode is a pixel electrode formed individually for each pixel, and each of the upper limit values of ranges for driving voltages of said R, G, and B driving signals applied to respective pixel electrode is set independently for R, G, and B light.